Abstract Submitted
for the MAR13 Meeting of
The American Physical Society

Quantum Oscillations and Superconductivity in Subband Quantized $SrTiO_3$ Bilayer Delta-Doped Structures[1] HISASHI INOUE, GLAM, Stanford University, MINU KIM, Department of Physics and Astronomy, Seoul National University, CHRISTOPHER BELL, YASUYUKI HIKITA, SIMES, SLAC National Accelerator Laboratory, HAROLD HWANG, GLAM, Stanford University & SIMES, SLAC National Accelerator Laboratory — $SrTiO_3$ delta-doped structures show two-dimensional (2D) Shubnikov de-Haas oscillations (SdH) and 2D superconductivity (SC) [1]. Lightly doped systems, with clear SdH signals are ideal to study the link between 2D single electron states and SC [2]. The subbands (SB) should strongly influence SC: their splitting is larger than the superconducting gap. However, the similar spatial extent of the SB in single delta-layers prohibits the detection of SB modulated SC. Growing two delta-layers (DL) in parallel with varying interlayer (IL) thickness d, we can spatially separate the SB and identify their contributions to SC and SdH. For small d, all SB spread over the DL and the IL. For larger d only lower SB are confined around the DL. From the angular-dependence of the main SdH frequency we find a 2D to three-dimensional crossover for $\sim 60 < d <\sim 100$ nm, hence the SdH originate from the upper SB. At the same time the SC layers are found to be decoupled, both showing 2D character with thicknesses comparable to the DL width. This implies that the lower SB contribute more to the SC. These results provide insights into the role of SB in 2D SC. [1] Y. Kozuka *et al.*, *Nature* **462**, 487 (2009). [2] M. Kim *et al.*, *Phys. Rev. Lett.* **107**, 106801 (2011).

[1]Supported by DOE under Contract No. DE-AC02-76SF00515.

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Date submitted: 07 Nov 2012 Electronic form version 1.4